

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

In this instance, the abstract recites the legal terms "wherein" and "comprised".

2. The abstract of the disclosure is objected to because "(Fig. 2)" should be deleted from the end of the abstract. Correction is required. See MPEP § 608.01(b).
3. The disclosure is objected to because of the following informalities: in paragraph [00042], 2nd line from the end of the paragraph, replace "carbonatious" with "carbonaceous". Corrections and/or clarifications are required for this and other possible grammatical/spelling/usage errors that occur throughout the specification.

Claim Objections

4. Claims 41, 44, 46, 48, 49, 53, and 57-60 are objected to because of the following informalities: in claim 41, 4th line of section a), delete "the" before "10 fold". In claim 44, 2nd line, insert "," after "Zr" for clarity. In claim 46, 2nd line, delete "[0018]" at the end of the claim. In claims 48 and 49, both claims are improperly dependent upon cancelled claim 21. In claim 53, 3rd line, delete "the" before "10 fold". In claim 57, 2nd line, insert "a" before "main" for clarity. In claim 58, 1st line, replace "process" with "casting mold" for consistency with the remainder of the claims. In claim 58, this claim is improperly dependent upon cancelled claim 30. In claims 59 and 60, 1st lines of both claims, replace "powder mixture" with "casting mold" for consistency with the remainder of the claims. In claim 60, this claim is improperly dependent upon cancelled claim 36. In claim 60, 2nd line, insert "," after "Al" for clarity. In claim 60, last line, delete "," before "and/or" for clarity. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 41-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langer et al. (US 6,155,331) in view of Noll et al. (US 4,938,802).

Langer et al. (col. 3, lines 14+) disclose a ceramic casting mold for use in precision casting, in which the casting mold 6 (see Figure 8) is comprised of a compositional mixture of a first material that is chemically inert (e.g. silica sand and zirconic sand) and a second material (e.g. organic binder) that is curable by a chemical curing process (of which the first and second materials form layers (6a,6b,6c,6d) that serve as a fill of ceramic material and/or reinforcing ribs and would be classified as “coarse” and “fine” particles in comparison with one another, and one of which include an organic binder as a coating material), such that the compositional mixture of first and second materials undergoes a melting/sintering process by an electromagnetic radiation device 7 (e.g. laser sintering), with a rapid prototyping process being used (in one embodiment – see column 9, lines 17-55) for manufacture of the casting mold (abstract; column 8, lines 56-67; column 9, lines 1-67; column 10, lines 1-58; and Figures 1-8). Langer et al. do not specifically disclose values/ranges of the thermal coefficient of expansion of the ceramic mold.

However, Noll et al. disclose a reusable ceramic casting mold, in which the ceramic casting mold comprises crystalline ceramic with a thermal expansion coefficient ranging from 0 to $15 \times 10^{-7}/^{\circ}\text{C}$ (in the range of 0° to 1000°C), such that this thermal expansion coefficient range is advantageous for preventing binding of the casting to the mold sections and for obtaining excellent dimensional stability, and would further be tailored by one of ordinary skill in the art to include even further improved properties (column 1, lines 5-10; and column 2, lines 25-59). In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the ceramic casting mold for use in precision casting, as disclosed by Langer et al., by using the reusable ceramic casting mold with tailored thermal expansion coefficient values, as taught/suggested by Noll et al., in order to prevent binding of the casting to the mold sections and for obtaining excellent dimensional stability (Noll et al.; column 1, lines 5-10; and column 2, lines 39-41).

Regarding the (product/article-by-process) "casting mold" claims 41-60 (casting mold made by the "generative rapid prototype" process of independent claim 41, and made by the "3D binder printing" process of independent claim 50), it is the examiner's position that the casting mold of Langer et al. in view of Noll et al. would be identical to

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or only slightly different than the claimed casting mold prepared by the method of the claim(s), because these casting molds would include nearly identical structural similarities as a result of its method of production, as set forth in the methods of independent claims 41 and 50. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to the applicant to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289, 292 (Fed. Cir. 1983). Langer et al. in view of Noll et al. either anticipated or strongly suggested the claimed subject matter. It is noted that if the applicant intends to rely on Examples in the specification or in a submitted Declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the teachings of Langer et al. in view of Noll et al.

Response to Arguments

8. The examiner acknowledges the applicants' amendment provided with the request for continuation received by the USPTO on April 1, 2008. In view of the applicants' amendments and remarks/arguments, the prior 35 USC 103(a) rejections

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are withdrawn. However, upon review, new objections to the abstract, specification, and claims, as well as new 35 USC 103(a) rejections, are provided in above sections 1-4 and 7. The applicants have cancelled claims 21-40, and have added new claims 41-60. Claims 41-60 are currently under consideration in the application.

9. Applicants' arguments with respect to claims 21-40 have been considered but are moot in view of the new ground(s) of rejection (of new claims 41-60).

With regard to the applicants' remarks/arguments on pages 6-11 of the amendment, it is noted that the applicants have claimed a casting mold made by the processes of independent claims 41 and 50. As a result, steps a-c of these independent claims impart very limited structural features to these casting mold (product) claims. Importantly, the coarse particles, fine particles, and organic binder would all undergo a change of structural characteristics upon melting and/or sintering to form the casting mold (product). Accordingly, a casting mold made out of all coarse particles (or all fine particles) – in its final form -- would apparently not be structurally distinguishable from the applicants' claimed casting mold having a mixture of coarse and fine particles. In this instance, the applicants are suggested to amend these "casting mold" claims 41-60 to become "process for making a casting mold" claims, such that the process steps would impart substantial patentable weight to these claims. It is noted that the applicants had included process claims in the prior amendment of claims 21-40 (that are now cancelled). In summary, process claims with distinct steps of making the casting mold would receive more favorable consideration.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kevin P. Kerns whose telephone number is (571)272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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